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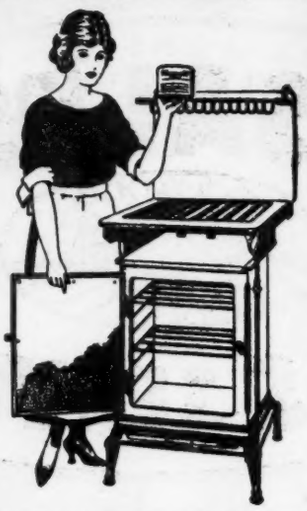

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The Gas Salesman and Gas Service.

VOL. 5, NO. 61.]

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APPOINTMENTS & PROMOTIONS.

Gas Salesmen, Showroom Attendants, and Manufacturers' Representatives are invited to send information as to promotion or changes in appointment for publication under this heading.

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EDITORIAL.

Lighting Data.

THE contributor of "Elementary Treatise on Gas Lighting," in the instalment published in this issue, raises a point which requires the serious attention of all engaged in the work of providing illumination by gas—especially the manufacturers of gas fittings, and those whose business it is to carry out installations. It is that the gas industry is terribly poverty stricken in the matter of data dealing with lamp characteristics—such as standardized reflectors, efficiencies, and application. Why are we so behind in this matter, while the electricity industry has made a special study of it? The answer can only be found in the fact that gas lighting—apart from the improvements in the appliances—has been a growth based on practical experience and traditional method rather than scientific research and technical considerations, while in other directions of service the contrary conditions prevail. The electricity industry, on the other hand, through its lighting engineers and the manufacturers of lighting accessories, has been much more fortunate in having, for many years, efficiencies and applications clearly defined on a scientific basis, although the industry is much younger than our own. The contrast is a little too marked to be pleasant.

It is true that in some of the catalogues of makers of burners, lamps, &c., data are given; but it is all too commonly incomplete, and therefore unreliable. And independent tests indicate that sometimes the figures are of an arbitrary character, and somewhat generous, or the tests of which they represent the results have been carried out under conditions of such superlative order that they have largely contributed to the meritorious behaviour. Between different makers, too, figures as to consumptions and efficiencies are found which show an inexplicable incongruity which can—assuming the data to be genuine and not mere guesswork—be due solely to the lamps. Consumption in cubic feet and a statement as to lighting power are not sufficient to-day. The calorific value and pressure of the gas must be given, as well as the efficiency realized, and a statement is necessary as to the conditions under which the tests were made. When standard testing conditions are formulated, it will be sufficient to give consumption, calorific value, and efficiency, with an intimation that there has been compliance with the standard prescription for testing. Only in this way can the efficiency and other statements regarding performance as presented by the manufacturers be acceptable, and subject, when desired, to confirmation by private tests. If large buyers like gas undertakings would insist on the information being given as to conditions under which the data can be reproduced, the manufacturers would then have to supply the particulars, which would include consumption, calorific value of the gas, pressure, testing angles, whether with or without reflector, and, if with one, a description of it.

Then, again, practical rules should be provided for installation work. There is too much rule-of-thumb about lighting installations in these days. Location of fittings appears to have had an eternal law applied to it, instead of being determined by requirements. The same applies to the degree of illumination for the purpose in view. There is also too much work done in the country to-day in which illumination is either wasted by a superfluous quantity being provided, or is grossly under-estimated. Where illumination in excess of need is provided, it means uneconomy; where it is under-estimated, it means dissatisfaction, and probably a change of custom. The manufacturers of gas-fittings could do a great deal to their own advantage, and to that of the gas industry, by issuing general installation rules and counsel for use by those who are engaged on such work throughout the length and breadth of the land. Proper installation is almost as important a matter as the efficiency of a lamp in relation to the expenditure of the activating agent—gas or electricity—by which the illumination is obtained.

In this connection, it will be interesting to gas salesmen to learn that the Department of Scientific and Industrial Research some time ago appointed an Illumination Research Committee; and they are engaged on a number of special problems in illuminating engi-

neering, which have arisen mainly in connection with the work of the Illumination Committee of the British Engineering Standards Association. The Research Committee will be dealing with such matters as the effect of the position of light sources in certain widely used enamelled steel reflectors for industrial lighting; the relation between glare and visibility in street lighting; temperature distribution in the glass and other parts of lighting fittings; investigation of the phenomena of glare; the effect of flicker on vision; the effect of illumination on the ease and accuracy with which fine work can be carried out; and measurement of mean spherical candle power. From the British Engineering Standards Association we are already receiving some of the fruits in the way of standard specifications. For example, they have issued a British standard glossary of terms used in illumination and photometry, as well as a standard specification for industrial reflector fittings for electric lighting. With this work going on, one may look forward to standard definitions connected with illumination which will be highly valuable in all lighting work; but we cannot tell whether or not we shall, through these authoritative researches and inquiries, obtain—at any rate, for some time to come—prescriptions as to standard methods of testing in different circumstances and for different purposes. Thus it is that we should like to see the manufacturers of gas-fittings co-operating in producing standard test conditions relating to the efficiencies of their productions, so that anyone picking up their catalogues may know actually what the data mean which they present, and that, by adopting the same standard conditions, they can make similar tests and reproduce the data. We fear that the suggestion will not be readily taken up in all cases; but we do think, if purchasers of lamps brought a little friendly pressure to bear upon the manufacturers, an effort would be made universally to comply with what we consider is something very desirable to the maintenance and progress of gas lighting in this country.

Jottings.

In his Presidential Address to the Institution of Gas Engineers (published in the "GAS JOURNAL" for June 9), Mr. C. F. Botley, indicating the magnitude of the gas industry compared with the electricity industry, gives the following figures (due to Mr. Thomas Glover, C.B.E., Past-President of the Institution) of the potential heat units per annum delivered to consumers: From electricity works, 17,697,000 million B.Th.U.; from gas-works—as gas 122,472,000 million, as coke 262,906,000 million, and as oils 32,659,000 million B.Th.U. In other words, the gas industry supplies each year more than 23 times as many potential heat units as does the electricity industry.

* * *

The following is an extract from Mr. D. Milne Watson's Presidential Address at the annual meeting of the National Gas Council held on June 1. "... That electricity can ever replace gas is too grotesque a suggestion to merit serious consideration. One does still find imaginative writers who dwell upon the alleged blessings of an 'all-electric house,' and envisage the time when electricity will have replaced both solid and gaseous fuel. If these people were to come down from the clouds, and acquaint themselves with a few mundane facts, they would discover, for instance, that the requirements of the domestic consumers in the area of my own Company alone, between noon and one o'clock on Sunday, would entail the installation of electrical plant having a capacity of over 2¼ million horse-power, or no less than eighteen times the capacity of the new super-station at Barking, which was opened by His Majesty the King."

* * *

Regarding conditions during the general strike, Mr. S. E. Halliwell, the Secretary and Commercial Manager of the Bristol Gas Company, informed us that consumers expressed their appreciation of the continuance of the gas supply throughout the crisis. It has certainly impressed upon them the value of gas for domestic uses.

* * *

On May 8 there was published in the local papers a letter from the Medical Officer of Health for Bristol. This letter, which was signed by Dr. D. S. Davies, Medical Officer of Health, and Dr. R. A. Askins, the Deputy Medical Officer, was as follows: We have no wish to interfere in the present industrial dispute, but we trust that nothing will take place to limit the supply of gas to the city. In the first place, the hospitals, devoted particularly to the care of the sick poor, are dependent upon gas for their cooking; and it is essential that properly prepared food should be supplied to invalids, otherwise their recovery will be much retarded or in some cases a fatal issue may result. Many of the hospitals have no alternative means of cooking if the gas supply is cut off. In the second place, gas has now become an essential factor in the lives of the great majority of the people, and is widely used not only for purposes of lighting, but particularly for cooking. Deprivation of this would mean not only that the adult workers would be improperly nourished, but that the children, upon whom the future of the race depends, would suffer especially, and might be permanently damaged through life. Food properly prepared is particularly essential for the growing child, and, though the adult body may successfully resist the temporary inconvenience, it was proved during the war that the young child, and particularly the growing child, was open to serious damage in the absence of adequate, sufficient, and properly prepared food. Deprivation of gas under present conditions practically amounts to deprivation of food.

* * *

Discussing a paper recently read by Dr. Parker Smith before the Institution of Electrical Engineers in Edinburgh, Prof. Baily, of the Heriot Watt College, said that the solution of the domestic problem of light, power, and heat lay in a combination of electricity and solid and gaseous fuel. It is interesting to note that Prof. Baily, who is a well-known authority on electricity, has a gas fire for heating his room at the College, and has in use at his house a gas cooker, gas fires, and a gas wash-boiler. On the question of domestic service with coal, gas, or electricity, Mr. J. Jamieson, Assistant Gas Manager to the Edinburgh Corporation, at a B.C.G.A. Conference at Perth in April, said that it was not so much a problem of the cost of running a particular service, but the cost of performing a measured duty. This point should be borne in mind by gas salesmen when they are confronted by competitors' figures which at first glance present a good case.

* * *

At the same meeting of the B.C.G.A. Mr. Jamieson remarked that if coke is used in conjunction with gaseous fuel the combination offers a sound, reasonable, and economic alternative to the use of raw coal for domestic purposes. This opinion is supported by the growing popularity of gas and coke for cooking and heating purposes. In 1901 the output of gas in Edinburgh was 1750 million c.ft., and by 1919 it had increased to 2009 millions—approximately 15 p.ct. gain. From that date progress has been more rapid; and in 1925 2599 million c.ft. were supplied.

* * *

Mr. E. L. Oughton, who is Sales Superintendent to the South Suburban Gas Company, read an interesting paper at the last meeting of the Midlands Circle. In this he pointed out that gas engines still constitute an important field, and that there is a promising outlet for small engines in connection with milk sterilizing plants, now almost universally adopted by dairymen. It has been found that some makers of this plant specify oil engines; and this should receive the attention of gas salesmen.

* * *

We thoroughly agree with Mr. Oughton when he says that there is a real need to watch new buildings during erection. His Company had complaints from some new houses that the gas fires supplied and fixed by the builder were "smelly," and that the flames sometimes blew back into the room. Upon investigation it was discovered that in one case two 8-in. fires were connected into one flue consisting of 2-in. drain pipes terminating in a cavity with an ordinary air brick. The other case had properly built flues, but these also had an ordinary air brick for the outlet.

* * *

In the same paper Mr. Oughton suggests that it is high time the gas industry perfected a self-lighting mantle. Certainly the advantages which would accrue from the absence of matches and by-passes would be enormous; and it is equally certain that any salesman who invented such a mantle would never more have to worry about the price of a 'bus fare.

* * *

At this month's meeting of the Southern District (Kent Area) Circle, Mr. P. Pickering, of the Rochester, Chatham, and Gillingham Gas Company, read a paper on the ventilation of gas appliances. Speaking about circulator flues connected with chimneys, he remarked that condensation sometimes causes difficulty. In the case of long chimneys it has been known to percolate through the brickwork, and destroy interior decorations. This does not appear to happen with short chimneys or with circulators connected to kitchen chimneys where the fire is used occasionally. It is necessary, however, to exercise caution before connecting circulators to bedroom chimneys and others which are used very infrequently.

* * *

Regarding the ventilation of gas cookers, we were much impressed, on a recent visit to the University College Hospital new buildings, by the excellent system which

has been designed by Mr. A. H. Barker, M.Inst.C.E., B.Sc. Over the cookers are glazed hoods communicating with ducts; and through these the air in the kitchens is changed 35 times an hour, or about once every two minutes. Even at the busiest times, the smell of cooking is completely suppressed by Mr. Barker's efficient scheme.

* * *

Approximately 52 million people in the United States now consume gas; and there are in use 9,800,000 gas stoves, 3,400,000 water heaters, and 4,400,000 room heaters. At present about 400,000 new consumers are being added annually.

* * *

On a site near Egham, between Virginia Water and Runnymede, a hundred houses are to be erected by order of the Egham Urban Council. These dwellings will be fitted throughout by gas, provision for a coal fire being made only in the living room. Each of the houses will contain one living room, three bedrooms, one bathroom, and a kitchen and scullery; and in all there will be eleven points for gas heating and lighting. A gas cooker, and a copper which communicates directly with the bathroom, will be installed in the kitchen. The adoption of the all-gas system reduces very considerably the cost of building material and labour, as small concrete flue blocks will be used instead of the old 9-in. blocks, and chimney breasts will be abolished.

Some Experiences and Remarks.

(Continued.)

By G. L. JENNINGS.

One of my most unpleasant experiences occurred one Christmas Eve, during a spell of hard weather, when it was necessary to take a supply of gas from a neighbouring Company. The two Companies were connected by a large main, and a booster was fixed so that gas could be taken from either Company, and supplied to the one requiring it. A long stretch of main (about 600 yards) was dormant; the valves being far apart, and both closed. This, of course, is bad practice; but there were special reasons for it in this instance. When the boosting was to start, the supplying Company's valve was opened slightly, and the contents of the dormant main blown out. After a certain period, the gas in the main was tested, and found to be coal gas. To ensure freedom from air, however, the gas was allowed to blow for a further period, and was again tested. It was unquestionably coal gas that was coming through. Both samples taken had burnt well.

The booster was then started, and the district valves were opened so that the gas was passed on to my Company's district. This was about 6.30 p.m. on Christmas Eve. We quickly discovered, however, that the lights throughout one portion of the district had failed. Without doubt what had happened was that a stratum of gas had run along the top of the dormant main, and the heavier air had remained at the bottom of the main.

The district affected contained a few hundred private consumers and one of the largest prisons. The convicts were in the prison chapel when all the artificial lighting failed. Fortunately they were returned to their quarters without trouble, and in the course of a few minutes the gas could again be lighted.

With regard to the private consumers, it was rather more difficult. A house-to-house call was made at once, but owing to the Christmas shopping many people were away from their homes. The danger of the situation will be apparent. If anybody had left lights burning, the gas would have been escaping. By 3 a.m. we had got access to every house. The incident shows what care must be taken in distributing gas. It cannot be too firmly impressed that, owing to its low specific gravity, gas will always tend to travel along the top of a main, and will not push out the entire contents of a pipe. The same effect can be noticed in any hot water installation. On first starting up, the flow pipe will be found to be hot on the top but cold underneath, even when the circulator has been lighted for some time.

The worst explosion I ever had to deal with occurred in one of the main thoroughfares in West London. We received notice shortly after one o'clock one Saturday afternoon that the gas had failed to a whole line of houses. These had been built as one block on the site of a large house which had been pulled down. About twenty shops had been erected on the site; and these lay back from the road, and were fronted by an exceptionally wide pavement. Owing to some private ground adjoining, a one-way feed main had been laid. As all the premises were affected, it was obvious that the supplying main was at fault. While we were seeing to this, the gas suddenly came on again. A meter had been disconnected in one of the houses, and a fitter was at once sent to refix it. In this house the service cock could not have been completely turned off. A few minutes afterwards an explosion occurred. The plate glass window of the shop went by me like snow, and lay across the street, making it white. Fortunately nobody was passing at the time.

It was the practice of the Company at that time to reduce the pressure considerably after the midday dinner period, and to increase it when gas was required for lighting and for tea. The main had subsided, and was sealed by 3 in. of water. Accordingly, when the pressure in the main was below this, no gas was available, but when the higher pressure was put on about four o'clock, the gas came through again. The main was afterwards laid as a through main.

The damage to the house was not great, but its effects were—as I have noticed when examining after explosions—particularly noticeable in the top floors. Though the explosion took place in the basement, and blew out the shop window, the first and second floors were not affected. In the top floor, however, much more damage was done.

Those who have had to deal with escapes from, and damage to, mains must have noticed how often the trouble occurs under, or close to, "pitched" crossings. There is one portion of a district which had originally been brick fields, and the excavated clay had been replaced with locally available refuse matter. Houses have existed on this site for many years, but the subsidence has not entirely ceased. The gas mains settle with the ground, but at periods of frost they break where the road is tightly held by the concrete and granite setts. In addition, of course, owing to the nature of the ground, iron has a tendency to deteriorate rapidly. The action of bad soil on cast-iron pipes is most noticeable. They become so soft that it is impossible to drill them. They were, needless to say, relaid at once when found in this condition. I have been able to cut pipes taken out of this ground as though they were lead.

I remember the laying of a service to a large building which was to be used for the exhibition of wild animals. When I visited the workmen, they were looking frightened. On inquiring what was the trouble, I received the following reply: "We do not like those vans. Two bears jumped out of the last one which was opened." These had got out of their cages, and on the door of the railway van being opened had emerged. It is not pleasant to work with loose bears about. The particular menagerie I refer to was the Bostock collection of animals at the White City.

I recall an interesting heating installation connected with animals. Hagenbeck's Circus was at Olympia, and it was desirable to increase the warmth to certain of the animals, particularly those of the ape species. Speed was essential; and gas was given the job. It was extraordinary to see the way in which the animals found which was the warmest corner of the cage, and how they located themselves there at once. The gas radiators were fixed outside the cages; but the apes got as close to them as possible.

Another peculiar gas installation occurs to me. The native kraals at the exhibition were fitted with gas radiators in all huts as soon as the autumnal weather started. The huts were straw-roofed, and safety guards had to be fitted. The radiators were fixed in the centre of the huts. In another case a large gymnasium had to be heated, and no floor space was available. Strong brackets were let into the wall at a height of about 10 ft., and on these the radiators were placed, being securely fastened back to the wall. This installation was perfectly successful; but it is unusual to see gas radiators where you ordinarily look for pictures.

With the hope of making these articles as readable as possible, I am varying the subjects. I therefore make no apologies for discussing housing schemes, and the part which gas plays, or should play, in them. My experience with builders indicated that they were anxious to do anything which would ensure a ready sale for their houses. I am referring to pre-war periods, when it was necessary for builders to offer inducement. One builder told me that he thought tiling, &c., as a selling attraction was being overdone. Other builders were using tiles lavishly; and it was expensive. He offered to spend some of the money saved on tiles in making his houses up-to-date in regard to gas. The Gas Company, of course, assisted in every way; and the houses erected were good specimens of all-gas dwellings.

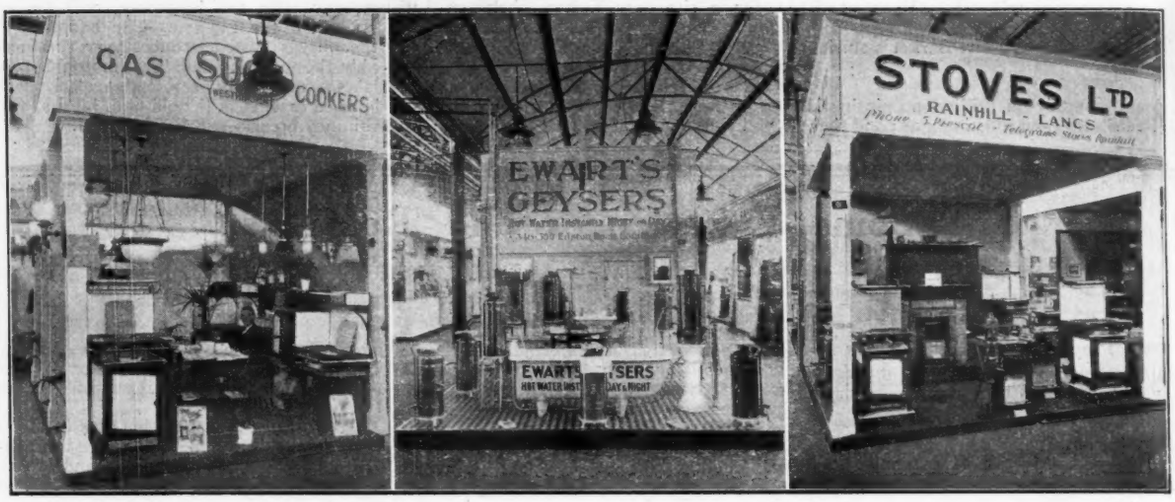
The builder found this a great aid to selling; and from that time all the houses that he has put up have been similarly fitted.

The average builder is frank regarding his view of gas. His point is, Will my outlay ensure, or tend to ensure, the sale of my house at a reasonable price? He will not spend his money unless he feels that he will benefit. It is for every gas company to demonstrate that he will.

The day must be coming when, to achieve their ends, gas undertakings will advertise the houses which are on sale in their districts, and in which gas facilities are provided. When they do, it will increase the builders' zeal to instal gas piping and appliances.

(To be continued.)

Health Exhibition at Leicester.

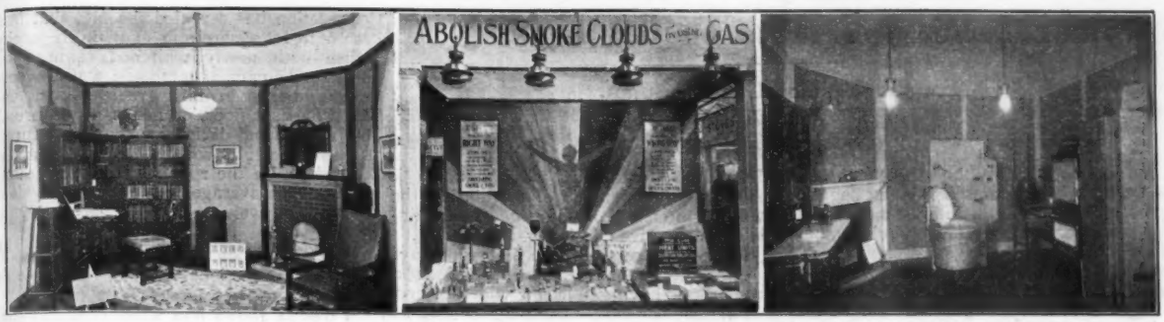


From Mr. Hubert Pooley, M.Inst.C.E., the Engineer and Manager of the Leicester gas undertaking, we have received some excellent photographs (reproduced here) of the gas exhibit at the Nation's Health Exhibition held at Leicester last month. The exhibition had distinguished support, not only from local executive health committees, but from over fifty of the principal national organizations.

The Gas Department were supported by most of the important gas apparatus manufacturers, including Messrs. Ewart & Sons, General Gas Appliances, Ltd., R. & A. Main, Ltd., the Parkinson Stove Company, Ltd., Radiation, Ltd., Stoves, Ltd., and William Sugg & Co., Ltd., all of whom had attractive stands.

The stand of the Gas Department was arranged as a suite of rooms, comprising dining-room, lounge, and kitchen, with an office and information bureau; while at one end of the stand the British Commercial Gas Association had their smoke abatement display.

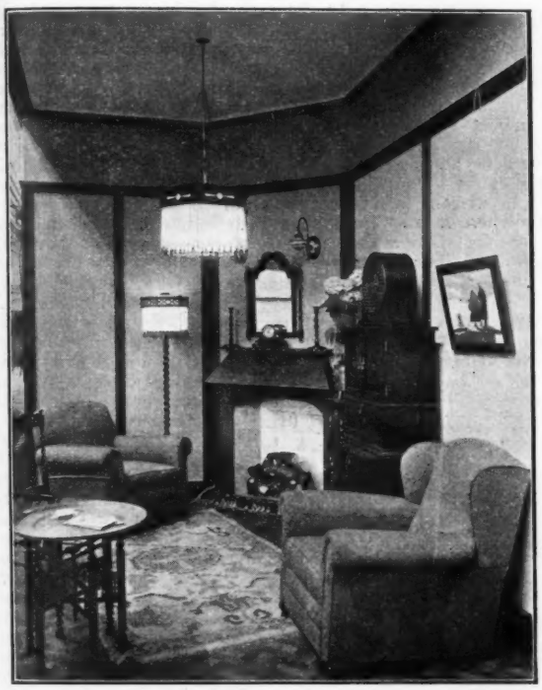
The dining-room was lighted by a centre superheated cluster burner beneath a large silk shade, and over the fireplace were brackets with inverted burners and shades. The fireplace was fitted with a red brick "Rubston" gas grate by the Davis Gas Stove Company, Ltd. The central lighting fixture in the lounge was similar to the above, but was fitted with a hexagonal silk shade in oak frame. There was also a Jacobean oak standard lamp with shade to match the pendant. The gas fire installed was a Parkinson "Cosie" inset fire in art bronze, which was fitted into a recess with oak mantelpiece specially designed and made in the Department's worshops. The office was lighted by a beautiful alabastria bowl fitting by Messrs. H. Jones & Son; the fireplace and oak surround being designed and made by the Department. The recess was complete with a "Metro" log fire.

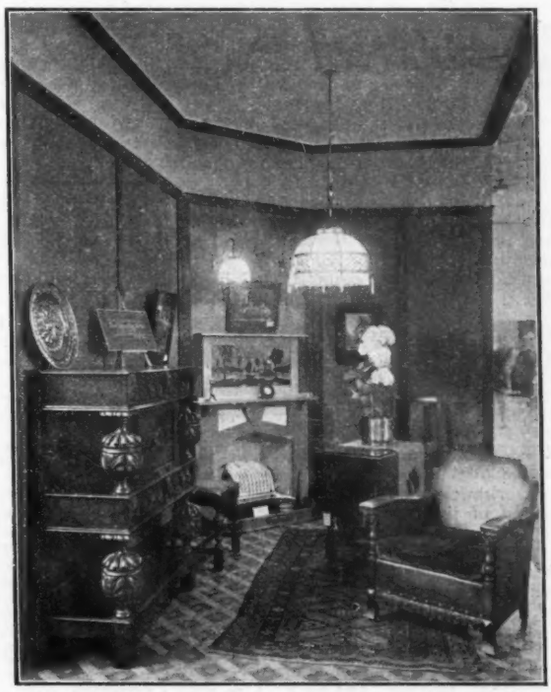


In the kitchen recess was an eye-level cooker; and alternative methods of providing hot water, by a gas circulator or a coke boiler, were demonstrated. A gas-heated wash copper and laundry iron were shown, and also the "Eco-Dry" clothes dryer, and, of course, a gas fire with suitable tile surround. The "Electrolux" gas-heated refrigerator was also exhibited.

Gas cookery demonstrations were given twice daily in the Empress Hall by Miss M. K. Gompertz, of the British Commercial Gas Association, under the auspices of the Institute of Hygiene. Lectures of interest were arranged by Radiation, Ltd., and propaganda films were shown daily.

The exhibition was largely attended, and Mr. Pooley tells us that the results were highly satisfactory. He feels sure it will benefit the Leicester Gas Department.





Hair-Dressing Demonstration.

We congratulate the Newport, Mon., Gas Company upon the effective showroom window display which they had during the week from April 14 to 21. In the window a demonstration of hair-dressing was arranged by Messrs. Leoni, Ltd., of Newport. The hair-dressing saloon was shown fitted-up with gas-heated water apparatus, gas curling-tong heaters, and a gas hair-drier. The display was a great success, and attracted immense crowds; but efficient and courteous arrangements made by the local police obviated any trouble. We thank Mr. J. Herbert Canning, the Engineer and Manager, for the photograph of the window.

Midlands Circle.—Owing to the coal strike, the Council of this Circle have decided to cancel the meeting which was fixed for July 7, at Leicester.

Fuel Cost and Total Cost.—According to Mr. Horace H. Clark, Industrial Gas Engineer to the People's Gas Light and Coke Company, of Chicago, writing in the "Gas Age-Record," one of the important fundamentals in gas selling is the total cost of an article. For example, to make the enamel and burn on three coats on an all-enamel gas range for which the manufacturer g ts $75. requires 75 c. of gas, or 1 p.ct. of the total cost of the stove. The average of many cost figures shows that the fuel cost is less than 5 p.ct. of the total cost, and this amount can frequently be saved in some other part of the process through the application of gas to the heating operation. In that case, the gas costs nothing.

An Elementary Treatise on Gas Lighting.

For the Student Gas Salesman.

[COMMUNICATED.]

(*Continued from p.* 124.)

A comparison of the three systems shows that they depend in varying degrees upon reflection from walls and ceilings. For instance, the semi-indirect relies much more than the direct system on such reflection; and the indirect still more. Reflection from walls, &c., always means loss of light by absorption; and therefore the indirect system is more expensive as regards the cost of energy dissipated to produce a given standard of illumination than the semi-indirect system, where the waste of light* is less. Similarly the semi-indirect is more expensive than the direct. In fact, as already intimated,* generally speaking lighting by the totally indirect system is about 100 p.ct., and by the semi-indirect system about 50 p.ct., more expensive than the simple direct or ordinary system.

It has been found in practice, with both gas and electric systems, that the consumptions required to produce a given mean illumination (for example, 3 foot-candles) over a certain working area with "direct," "semi-direct," and "totally indirect" methods are, generally speaking, approximately in the ratio of 1 : 1·5 : 2.

Adverting to utilization efficiencies. The ratio of the lumens incident on the working plane† to the total lumens generated by the lamp is called the utilization efficiency. The coefficient of utilization therefore expresses the net illuminating efficiency of a lighting system when there are taken into account the efficiency of the reflectors, the type of light distribution, and the light reflecting properties of surroundings—ceiling, walls, &c. The structural features and the dimensions of the room relative to the mounting height of the lighting units also have a bearing on the total amount of light incident on the working plane, as these affect the proportion of light that passes to the side walls.

The technical staff of Messrs. Holophane, Ltd., have determined a table of utilization constants, based on the foregoing definition of efficiency of utilization, in respect of their various reflectors, hemispheres, &c., when mounted in rooms having different styles of internal decoration—light, medium, and dark. One will readily appreciate the convenience of such a table as the following (extracted from the engineering data section of Messrs. Holophane's catalogue) when allusion is made later to methods of calculating the average intensity of illumination obtainable from a given lighting installation.

TABLE 12.—*Utilization Constants* (*Holophane*).

Ceiling	Light.			Medium.			Dark.	
Walls	Light.	Medium.	Dark.	Light.	Medium.	Dark.	Medium.	Dark.
Extensive reflectors	0·66	0·62	0·54	0·58	0·54	0·50	0·46	0·43
Semi-indirect bowls	0·49	0·45	0·41	0·44	0·41	0·37	0·33	0·32
Indirect units	0·33	0·30	0 26	0·23	0 20	0·18	0·12	0·10

* See remarks on utilization efficiencies.

† N.B.—Foot-candles × square feet = lumens.

EXAMPLE.—On a working plane 2 ft. 6 in. above floor level the mean illumination in a hall 60 ft. long by 30 ft. wide is 3 foot-candles. Total lumens incident on working plane = 3 × 60 × 30 = 5400. Suppose there were three lamps producing this illumination with a certain scheme of decorations—viz., dark wood roof (lofty) and pink distempered walls with 3 ft. madder brown dadoes—and that the M.S C.P. of each source was 300. Then, since the total flux in lumens is given by $I_0 \times 4\pi$, it follows that each lamp has an output of 300 × 4 × 3·142 lumens, and the three lamps have an output of 3 × 300 × 4 × 3·142 = 11,311·2 lumens. Hence the coefficient of utilization for the given arrangement of lighting equipment becomes $\frac{5400}{11,311·2}$ = 0·48—a value sometimes spoken of as the factor of utilization. We shall advert to this matter in a subsequent chapter on illuminating engineering calculations.

The effect of surroundings upon calculated values of illumination has been conveniently tabulated by the Holophane Company as follows:

TABLE 13

Condition of Ceiling.	Condition of Walls.	Percentage Increase in Illumination over Calculated Values *
Very dark	Very dark	0
Medium	Very dark	15
Very light	Very dark	30
Medium	Medium	40
Very light	Medium	50
Very light	Very light	80

* These values relate to "Holophane" reflectors used in rooms of small or medium size. In large interiors the effect of reflection from walls would be less important, though ceiling reflections must be considered.

This table shows that in a moderate-sized room having a clean white ceiling and medium-coloured walls the diffused reflection from ceiling and walls increases the effective value of the light source by about 50 p.ct. in all average cases—an increase which is usually more than sufficient to compensate for absorption losses due to the use of glassware. Given, in addition to a clean white ceiling, very lightly tinted walls, diffusion may increase the illumination by as much as 75 to 80 p.ct. It will be clear, therefore, that the character of the surroundings in any interior may affect to a considerable extent the quantity of light required. Moreover, the effect of furniture, carpets, hangings, &c., must not be overlooked; and a series of interesting tests‡ in this connection has revealed the fact that in a room 16 ft. square and 12 ft. high—a city office with newly whitened ceiling and primrose cream distempered walls, woodwork finished in dark green enamel, unoiled parquet floor, carpet of a mixture of buffs, red, and dark green, and the furniture of a dark brown tint—there was a loss of light with the room furnished amounting, for the average of illumination values taken at twelve different locations, of 14·2 p.ct. (p.ct. loss = $\frac{\text{furnished}}{\text{unfurnished}}$). The smallest reduction at one point was 6·6 p.ct., and the largest 22·2 p.ct.

‡ Made by A. Blok, B Sc., and described fully on pp. 152-153 of "Elementary Principles of Illumination and Artificial Lighting," 1924.

Table 14 shows how some coloured surfaces appear to absorb light, or rather do not reflect it; and it is clear that in such a case a given space would probably necessitate the provision of two to three times the amount of light that the same space would require if its boundaries were covered with a material having a high light-reflecting value, or, as it is more generally called, a high coefficient of reflection.

In the case of coloured papers "only the yellows, and pink or green so light as to give a strong reflection of white light from the uncoloured fibres, have coefficients of diffuse reflection of any considerable magnitude. Very light colours in general diffuse well, owing to the uncoloured component of the reflected light; but of those at all strongly coloured, only the yellows are conspicuously luminous. Of course, all of the papers when dirty diffuse much less effectively than when clean; and the rough papers, which have the highest coefficients of diffuse reflection, are particularly likely to become dirty." (Bell.) Dr. Sumpner, many years ago, made experiments to determine the amount of this diffuse reflection which becomes available for illumination, by comparing the light received directly from an illuminant with that received from the same illuminant by one reflection from a diffusing surface; but in practice now, when accurate values are required, use is usually made of a portable illuminometer such as the Holophane lumeter, whereby one is enabled to measure the reflection coefficient of the walls and ceiling of any room—due allowance, of course, being made for the window space. However, where a high degree of accuracy is not called for, the values given in Table 14 will enable one to approximate the increase in illumination due to diffuse reflection; but, as in practice the surfaces of rooms have widely differing values of R, a mean value must be arrived at to ascertain the aggregate effect of all the surfaces. Thus "if S_1, S_2, S_3, &c., be the areas of the several walls and ceiling, and R_1, R_2, R_3 their respective coefficients of diffuse reflection, the mean coefficient for the room is given by—

$$R_m = \frac{S_1R_1 + S_2R_2 + S_3R_3}{S_1 \quad S_2 \quad S_3} \quad \ldots \quad \text{"(A. Blok)}$$

Example:

Room 14 ft. by 14 ft. by 9 ft.

Area of the four walls = 4 × 14 × 9 = 504 sq. ft. (S_1)
Area of ceiling, 14 ft. by 14 ft. . = 196 ,, (S_2)
Area of floor, 14 ft. by 14 ft. . = 196 ,, (S_3)
Walls distempered light buff (clean) R_1 = 0·36
Ceiling newly distempered white . R_2 = 0·70
Floor 12 ft. by 12 ft., plain dark blue carpet with dark linoleum surround . . . . . R_3 = (say) 0·05

NOTE.—White distempered frieze and white painted skirting and door not allowed for, it being assumed that their sum effects would be neutralized by the cretonne window curtains of mixed colouring.

$$R_m = \frac{(504 \times 0·36) + (196 \times 0·70) + (196 \times 0·05)}{504 \quad + \quad 196 \quad + \quad 196}$$

$$= \frac{181·44 + 137·20 + 0·98}{504 \quad + \quad 196 \quad + \quad 196} = \frac{319·62}{896·00} = 0·357$$

Correct to two decimal places, the mean coefficient of diffuse reflection becomes, in the case before us, 0·36—the value of R_m. By substituting the value of R_m in the following general equation (*a*), we are able

TABLE 14.—*Values of Coefficient of Diffuse Reflection of Various Surfaces, Collected from Several Sources.**

Surface.	Coefficient of Reflection.	Surface.	Coefficient of Reflection.
White blotting paper	0·82	Tracing cloth	0·35
White cartridge paper	0·80	French grey matt	0·28
White glossy paint	0·78	Dark green matt	0·27
Aluminium paint	0·72	Dark grey matt	0·22
Caen stone	0·72	Dark red brick	0·22
Ordinary foolscap	0·70	Yellow-painted wall (dirty)	0·20
White distempered ceiling	0·70	Plain deal (dirty)	0·20
Chrome yellow paper	0·62	Light emerald green paper	0·18
Cream paper	0·56	Ordinary glass	0·14
Light cream paint	0·52	Dark brown paper	0·13
Light orange paper	0·50	Cobalt blue paper	0·12
Light red brick	0·46	Vermilion paper	0·12
Concrete (unpainted)	0·45	Red carmine matt	0·09
Light green matt	0·41	Black paint matt	0·06
Medium yellow paper	0·40	Dark green paper	0·05
Yellow-painted wall (clean)	0·40	Deep chocolate paper	0·04
Plain deal (clean)	0·40	French ultramarine-blue paper	0·035
Light buff matt	0·36	Black cloth	0·012
Light pink paper	0·36	Black velvet	0·004

*These values are usually indicated by the symbol R.

to calculate the increase in illumination due to reflection from the surfaces in question.

(a) $\phi^1 = \frac{\phi}{1 - R_m}$ { ϕ^1 = Flux of light from source *plus* flux from secondary sources — viz., walls, ceiling, &c. ϕ = Flux of source only

(b) $\phi^1 = \frac{\phi}{1 - 0{\cdot}36} = \frac{\phi}{0{\cdot}64}$

Calling ϕ unity, we get $\frac{1}{0{\cdot}64} = 1{\cdot}56$

Hence the candle-power of the illuminant would be virtually increased by 56 p.ct. in the case of an empty room of the size and decorations, &c., as specified above, in consequence of the boundaries of the room in question acting by reflection as secondary sources of light. The following extract from Dr. Bell's "Art of Illumination" (see pp. 209-210, 1912 edition) has reference to this matter of the practical amount of help received from diffusion.

"The effective illumination of a room depends upon two factors—(1) the actual power of the radiant in candles; and (2) the nature of the surroundings which determine the character and amount of the diffuse reflection which reinforces the direct light. If the radiant in a closed space furnishes a certain quantity of light, L, then the strength of the illumination produced at any point within the space will depend, if the walls are non-reflecting, simply on the amount of light received from the radiant, in accordance with the law of inverse squares.*

If the walls reflect, then the total illumination at any point will be that received directly, L, and in addition a certain amount RL (where R is the coefficient of reflection), once reflected, a further amount R^2L twice reflected, and so forth. The total illuminative effect will then be:

$L(1 + R + R^2 + R^3 + \ldots\ldots R_n)$.

As obviously R is always less than unity, this series is convergent upon the limiting value $L\left(\frac{1}{1-R}\right)$, which expresses the relative effect of the walls in reinforcing the light directly received from the radiant." It is clear from the values of R already given (see Table 14) that such assistance may be of very great practical importance; and the following table, due to the late Dr. Louis Bell, shows the results for values of R between 0·05 and 0·95.

TABLE 15.

R.	$L\left(\frac{1}{1-R}\right)$.
0·95	20·00
0·90	10·00
0·85	6·66
0·80	5·00
0·75	4·00
0·70	3·33
0·65	2·85
0·60	2·50
0·55	2·22
0·50	2·00
0·45	1·81
0·40	1·66
0·35	1·53
0·30	1·42
0·25	1·33
0·20	1·25
0·15	1·17
0·10	1·11
0·05	1·05

The meaning of this table is clear. It shows, for example, that the illumination at any point in a room of medium size, having surfaces which possess a mean reflection coefficient of (say) 0·45, would (theoretically) be 81 p.ct. greater than the illumination produced by the same illuminant in a room of similar size possessing dead black surfaces throughout, in which case, of course, the coefficient of reflection would be zero.

(To be continued.)

* This law was explained in Chapter 4, "SALESMAN" for Jan. 31, 1923.

N.B.—The law in question can, in practice, be considered only as a useful guide. It is exact only in the rare case of radiation from a point into space when there is no refraction or reflection; and this is seldom (if ever) encountered. In the case of a room decorated in white, an attempt to apply this law would lead to grossly inaccurate results.

Showrooms of the Sheffield Gas Company.

[See Illustrations on Next Page.]

As a natural sequence to the increased business and the subsequent development of the Sales Department of the Sheffield Gas Company, it is interesting to record that the present showrooms situated at 15-17, High Street, Sheffield, have recently been extended.

The Company are to be congratulated on securing an excellent basement which has the advantage of approach through the main entrance to the present showrooms. The thoroughfare is looked upon as the best shopping centre of Sheffield; and now that the extensive alterations have been completed, the public are assured of even better service than heretofore, as they will find the new exhibits both interesting and instructive.

The approach to the basement is by means of a new staircase which leads from the shop level down to the additional premises. These have the advantage of being both lofty and roomy; the dimensions of the main apartment are approximately 60 ft. by 35 ft.

The lay-out is sectionized, the idea being to show the different domestic and industrial applications of gas. Special attention is given to demonstrating the various types of appliances under actual working conditions. The decoration of the showrooms is excellent.

The lay-out may be described as follows:

SECTION 1.

Lecture Room.—Platform fitted with types of cookers on which the Company's own lady demonstrator will lecture and give cookery demonstrations personally. Seating accommodation for 100 people.

SECTION 2.

Hot Water Section.—Working models of circulators, geysers, boilers, apparatus suitable for basins, &c.

SECTION 3.

Gas Fires.—Exhibit showing the utility of the gas fire for any class of building. Special arrangements as to adaptability.

SECTION 4.

All-Gas Kitchen.—Two typical examples of gas labour-saving kitchens, one showing a combination of gas cooker, hot water circulator, and gas fire; the other demonstrating a gas cooker and coke fired boiler.

SECTIONS 5, 6, AND 7.

Industrial.—Gas furnaces suitable for annealing, hardening, forging, and other heat treatment of metal as used by Sheffield trades. Gas blowers, pyrometers, pressure gauges, and furnace accessories.

SECTION 8.

Centre Position.—Display of modern gas apparatus and fittings, including glassware.

The section to be used as a lecture room can be isolated from the rest of the premises by means of heavy curtains. This arrangement will permit of the usual showroom routine proceeding without any interruption during such times as the section is in use for lectures or demonstrations. At the same time, visitors to these functions are assured of comfort without publicity.

It is the intention of the management to place an expert cookery service at the disposal of the Sheffield public; and demonstrations are arranged to take place in these premises each Tuesday and Thursday until further notice.

The lighting is effected by Sugg's 6-light "Bon Marché" pendants, aug-

mented with " Flambeau " brackets and special earthernware pendants over the platform. The lamps are fitted with distant control devices, and the entire installation is so arranged that each section may be lit and extinguished at will by separate taps.

So that any visitors may have first-hand information relative to any of the appliances on exhibition, a specially designed card is placed beside each appliance, giving a brief description of its particular application and terms of sale.

The accompanying photographs indicate the lay-out described above.

Nautilus Chimney Pieces.

The Nautilus Fire Company, Ltd., have published a series of illustrations of complete Nautilus mantel suites embodying Davis gas grates. The first thing which strikes one in looking through this handsome publication is the refinement of even the simplest and least expensive of the chimney-piece designs. The artistry of the complete suites is calculated to make an immediate and lasting appeal to persons of taste. At the end of the publication is an illustration of a section of a house indicating the function of the " Nautilus Economy " gas flue. The latter consists of a number of cast-concrete blocks built into the thickness of the wall. These flues enable substantial sums to be saved in building construction in the absence, not only of the projecting chimney-breasts which the orthodox 9 in. by 9 in. flue involves, but also of foundation concrete, brick footings, trimming joists and trimmers, concrete hearths, skew-back arches, and large brick chimney-stacks. The economies effected by the employment of " Economy " flues are substantial. In a recent case of a block of flats, their use resulted in a saving of half-a-million bricks, or £100 per stack. The booklet, which is exceedingly well prepared, is intended primarily to further the popularity of gas fires among architects.

Cost of " Using " Fuel.—In an address Mr. H. H. Clark (of the People's Gas and Coke Company, Chicago) drew attention to an important consideration in connection with industrial gas salesmanship. This was the cost of using fuel, which includes not only the first cost of the crude fuel—be it coal, coke, oil, &c.—but the added expenses, which are many and necessary, to use the fuels. Gas often costs most to buy, but least to use. In comparing fuels, it is not what it costs to buy them, but what it costs to use them that counts. For example, oil costing 5 c. a gallon to purchase, may cost 5 c. to 10 c. more per gallon to use. This added cost represents expense for freight, unloading, pumping, storing, heating, air for combustion (oil requires more than gas), furnace heat losses (oil furnaces are larger than gas furnaces for the same output), production losses, furnace maintenance, and other items.

Ideal Kitchens.

"Don't find fault; find the remedy. There are kitchens—cool, clean, and convenient—that make you feel you want to get busy with a basin and spoon; there are others that make you want to turn your back and close the door." These are the opening lines of an illustrated brochure which has been prepared for their consumers by the Newcastle-upon-Tyne and Gateshead Gas Company, and which describes four examples of ideal kitchens where order, convenience, and economy rule.

The first example is of a labour-saving kitchen in which no coal is used. It is fitted with the latest type of gas cooker with raised oven, a "B.T.U." circulator serving a 20-gallon storage cylinder, a linen-drying cupboard, a small gas fire, a gas wash-boiler, and a gas iron. The running costs of this equipment (Newcastle domestic gas costs 8·6d. per therm) are given as follows:

Cooking.—(*a*) A four-course luncheon for four persons, with two vegetables, can be cooked to perfection for 1¼d. worth of gas.

(*b*) Boil ten 3-pint kettles of water for 1d.

(*c*) Cook a breakfast for four persons, with speed and certainty, for ½d.

(*d*) Bake six loaves and a tart for 1d.

(*e*) Keep a pan simmering for 8 hours for 1d.

Hot Water.—The 20 gallons can be heated for 2d.

Wash-Boiler.—Average cost 1½d. per hour.

Gas Iron.—Costs ½d. per hour.

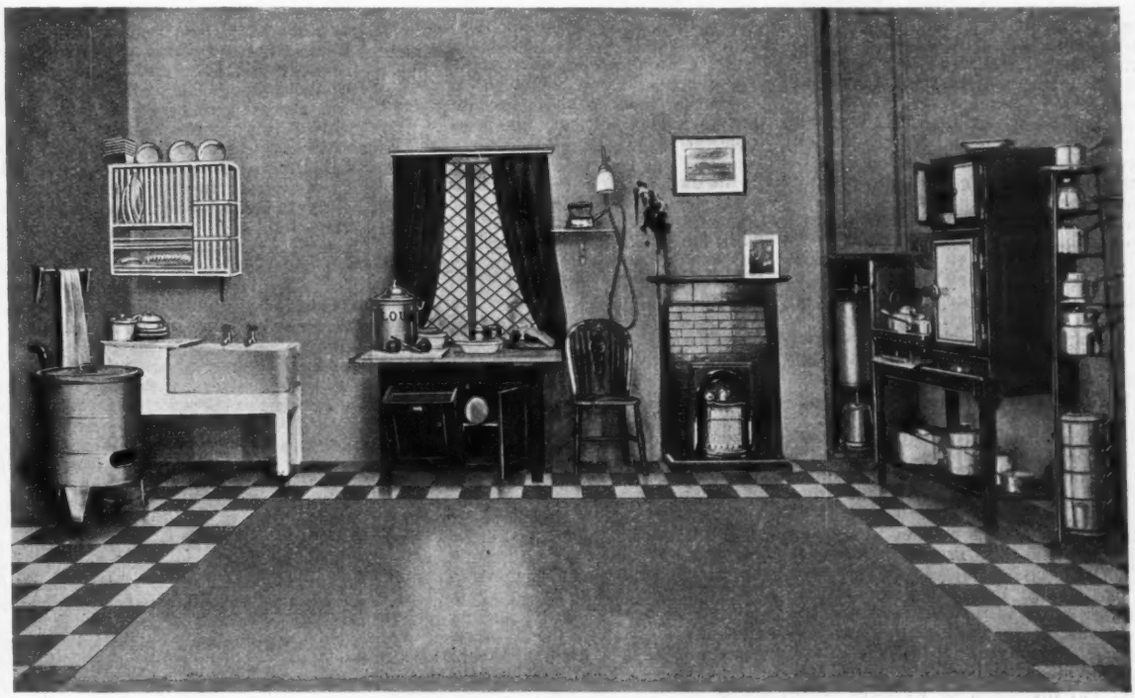
It is mentioned that the average kitchen range consumes about 8 tons of coal per annum, costing about £12.

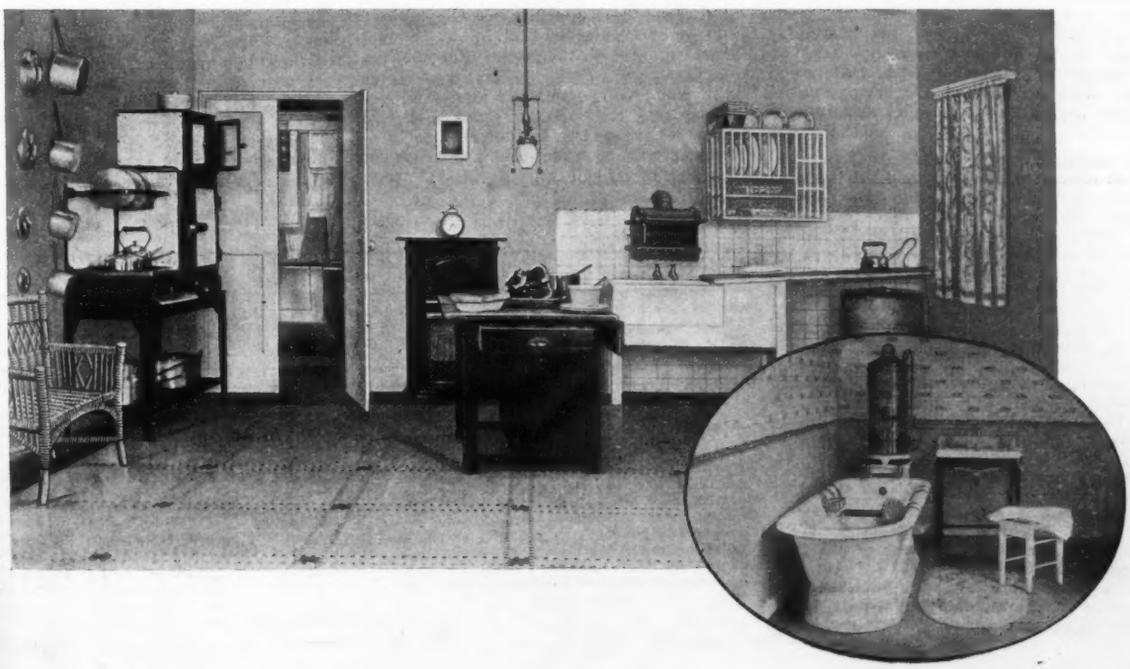
In the second example there is an instantaneous gas water-heater above the kitchen sink; the supply of hot water for bath purposes being obtained by a geyser. It is stated that for washing-up purposes a gallon of hot water can be had for ½d., and that a hot bath costs less than 2d.

In the third example the winter hot water requirements are met by a coke boiler, the running cost of which is put at 3d. per day. For summer use, a "B.T.U." gas boiler is installed. The fourth example shows the replacement of a coal range by a tiled recess in which are fitted a gas cooker, a small gas fire, and a gas boiler.

Two illustrations from the booklet are reproduced here.

A personal letter accompanies each booklet sent to the consumer; and the Newcastle Company intend to follow-up this first letter by others, until they gain an interview or find that there is no chance of doing business.





B.C.G.A. Gas Salesmen's Circles.

Midlands Circle.

A Meeting of the Circle was held at the Chamber of Commerce, Birmingham, on Wednesday, June 2. In the absence of the Chairman (Mr. W. Wilberforce), Mr. R. J. ROGERS (Birmingham) presided.

SELLING GAS FOR LIGHT, HEAT, AND POWER.

By E. L. OUGHTON, Sales Superintendent of the South Suburban Gas Company.

The selling of gas for light, heat, and power is to-day a different proposition from what it was ten years or so ago. Competition is becoming increasingly keen, and the gas salesman must of necessity keep himself in touch with all commercial and technical developments in connection with gas and the competitive agents.

The impetus given to the electricity industry by means of the free publicity afforded by the successive wooing of the political parties is undeniable. In actuality it may or may not mean as much as it sounds, but it has undoubtedly quickened the electrical sense of the ordinary man and woman, and it may require a year or two to convince many of the fatuous claims made by the propagandists on its behalf. It is not enough to proclaim that the gas industry has nothing to fear from this intensified competition; we must, as some writer said, "think as though success were certain, work as though it were not."

The electrical industry has thrown down the gauntlet; and if the combat is to be equable, the weapons must be similar, according to the laws of combat from early times.

Advertising experts some time ago adopted the motto "Truth in Advertising" in all good faith, yet the study of rival propaganda in any branch of commerce forces one to realize that both cannot be speaking the truth, as they are contradictory. Truth "in" advertising is not enough, it must be the whole truth, and nothing but the truth, as we have often been reminded. One naturally expects enlargements, if nothing worse, in the Daily Press, but the following "inspired" paragraph in "The Times" for March 23 could hardly have appeared if those on whose behalf it was published believed in truth in advertising, or had been required to take the legal oath as to its veracity.

THE ELECTRIC HOME.

A demonstration of the domestic possibilities of electricity was given in Electric House at the Ideal Home Exhibition, Olympia, yesterday. By setting a time switch overnight, the sleeper can be awakened by a singing bird and a fire set going, while a cup of tea can be provided without his getting out of bed. The fire and the bird are said to cost a penny a day for current, and a night light will burn 200 hours for 6d. For 4d., baths can be provided practically all day. A towel heater costs ½d. per hour, washing, drying, and ironing costs 2½d. per week for power for a family of four, and ½d. per hour will do the washing-up for eight people. Cooking works out at 1d. per person a day. A sewing machine can be run for 75 hours for 1d. These figures are based on supply of electrical power at 1d. per unit. The initial cost of the apparatus is a little more complicated. The home can be fairly well equipped for £100, and most of the makers of electrical equipment supply on the extended payment system. Houses are now being built at a cost of £1000 especially adapted for electricity.

For sheer seductiveness, it is hard to beat. It states that "the fire and the bird are said to cost a penny a day." The thinking man and woman ask, "Who said?"

The comparative costs given by Mr. R. J. Rogers to this Circle in November, 1924, adequately contradict the ambiguous statements referred to.

While we have specifically mentioned an electrical advertisement, there are makers and vendors of gas apparatus who are not free from blame in the way they advertise their goods. They should be compelled to prove the truth of the slogans they adopt in the endeavour to create desire on the part of the public.

We have been frequently reminded recently that the gas undertakings are under a responsibility to offer a system of maintenance, either free or otherwise, in order that the appliances sold may retain their original efficiency as near as possible. It is but the initial stage to receive the order for the appliances; the retention of the customer indefinitely is of equal importance. Our competitors jump at the opportunity of comparing electrical costs with inefficient—often through neglect—gas appliances, and sometimes there is a stratum of truth in the comparisons in these deplorable instances. Whatever advance electric lighting has made, it is certain gas lighting has not been retrogressive in the last few years. Gas is still a potent factor where eyesight is valued or the pocket has its limitations. It can meet every scientific requirement for the plain citizen in his home and shops, or the municipal authority in its streets.

Is not the time long overdue for the gas industry to concentrate on, and by research work perfect, a self-lighting mantle? Surely it is not beyond the skill of British chemists to perfect such a mantle, when the Continental chemists have probably gone half-way towards solving this very important matter. The tremendous advantages accruing from the absence of by-passes and matches are beyond estimation.

If we realize the immense progress made in gas lighting from the flat-flame burner to the superheated type and high-pressure lamps, is it not too early to admit that finality has been reached?

Then the development of the "daylight" mantle by the South Metropolitan Gas Company (shown at the Ideal Home Exhibition) will materially assist in retaining gas lighting for shops and textile factories, &c., and if applied to high pressure will increase the popularity of this form of outside shop lighting.

While we cannot compete with electric lighting for certain methods of interior window lighting, we are still in the field—or should be—for ordinary houses, public buildings, and street lighting; and is it not our duty to emulate in principle the unforgettable spirit of those who defended Verdun? The well-prepared booklet of photographs by Messrs. Wm. Sugg & Co., showing public lighting at home and abroad, ought to act as a tonic to the "nervy" ones in the gas industry, and as a spur to the whole industry to maintain the high standard already established.

The gas salesman must understand the rudiments of illuminating engineering, and be able to apply them in any installation he undertakes to quote for. We should have polar curves of the various lamps and burners with different globes and shades to meet the various needs. These will enable him to arrive at the desired illumination, and so determine the height and spacing of the lighting units, and at the same time avoid unequal or patchy lighting effects.

When in direct competition with electric light, and assuming a minimum illumination is agreed upon by the architect, gas is lower in cost. The by-pass consumption must be noted, and cut down wherever possible by using cluster lamps with one by-pass. The coefficient of reflection must be taken into account, and allowances made according to the final decorations of the building and, in workshops, the colour of materials used. This is emphasized when we realize that the values of the coefficient of reflection vary from white blotting paper 0·82 to black velvet 0·004. The full list of coefficients is available to all.

The application of gas for heating is the most important and extensive section in the utilization of gas; and from the simple operation of the gas ring to the many trade and industrial uses, the underlying principles are the same. In the great majority of cases gas is without doubt far more economical than, and equally efficient as, electricity.

The gas salesman must always remember there are limits to the work done by 1 B.Th.U. in practice, and no one can reach the 100 p.ct. figure, though some try to pass this when in competition. The development of the technically trained gas salesman has done much to prevent makers claiming impossible efficiencies for their apparatus. The writer remembers only a few years ago several cases where the figures given in trade catalogues worked out at the wonderful efficiency of 300 p.ct.

Would it not be to our advantage if the Circles held some discussions *in camera*

	Points per House.																
Jan.—March.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18 to 40.
1924 . . .	11	51	61	57	25	17	53	20	18	24	9	6	8	9	2	3	2	7
1925 . . .	8	28	32	48	58	34	62	9	15	25	14	8	5	4	9	2	14	27
1926 . . .	14	38	18	26	223	91	63	18	34	35	11	14	6	3	3	8	2	31

	Quarter Ended March 31.		
	1924.	1925.	1926.
Number of houses carcassed.	393	402	638
Average points per house.	5·9	7·7	6·6
Carcassed by builders	17 p.ct.	11·69 p.ct.	6·6 p.ct.
Carcassed for gas lighting	41·7 p.ct.	28·85 p.ct.	21·3 p.ct.
Where electricity available	24 p.ct.	50 p.ct.	60·3 p.ct.
Appliances supplied by builders	3 p.ct.	1·2 p.ct.	0·5 p.ct.

Council housing schemes excluded.

when considering (say) makers' claims and competitive and "border line" topics, in order that full and frank consideration may be given to these most important subjects? We must be prepared to draw the line as to when gas or coke should be advocated as the heating agent. Many customers well disposed towards the use of gas as a fuel have been alienated through the over zealous salesman suggesting the use of gas when it should have been coke.

Specially designed gas boilers for large domestic and central heating installations —such as the Spencer-Bonecourt, Pattison, Potterton, and Keith Blackman types —have considerably extended the field for gas. The rapid development of the domestic coke boiler and the slump in the gas coke market have considerably changed the perspective of many gas undertakings, so that water heating problems are now viewed from the dual standpoint of gas and coke.

At the risk of giving the lie to the title of my paper, probably the outlines of two recent experiences in connection with the sale of coke boilers may be of interest to the younger members. A coke boiler was ordered to take the place of a back boiler in a discarded coal range. We suggested that the Company should fix it, as it might be necessary to rearrange or renew parts of the piping. The offer was declined, as the customer had an expert hot water fitter in his employ at an engineering works. After three or four months' use, the boiler cracked, and flooded the kitchen. A new interior was supplied, and fixed by the same man, who said the original casting was defective. The second interior cracked the next day, and a further one was supplied, together with the suggestion that it would be well to examine the condition of the flow pipe, and see if there was a stoppage. This was done prior to fixing the third interior, and the flow pipe was found to be solid for about one foot immediately above the boiler.

Gas engines still constitute an important section, though competition is becoming keener each day owing to the low cost of oil and electric power. There is a promising field for small gas engines in connection with milk sterilizing plants, now almost universally adopted by dairymen. We find, however, that some makers of this plant specify oil engines, probably owing to the large number sold to the isolated farms in the country, where town gas is unavailable, through unwillingness of many undertakings to supply high-pressure gas at 20 to 50 lbs. per sq. in. in those areas. We have been successful in installing gas engines up to the present—chiefly on the three years' hire-purchase system.

To illustrate the necessity for watching new buildings during erection, we had complaints in some new houses that the gas fires supplied and fixed by the builder were "smelly," and the flames sometimes blew back into the room. Upon investigation, it was found in one case two 8-in. fires were connected into one flue consisting of 2-in. drain pipes, and terminated in a cavity with an ordinary air grate. The other case had proper flues built, but these also had an ordinary air brick for the outlet. The builders have now arranged to use the "Siventa" outlet.

With regard to carcassing new houses, we have derived advantage in maintaining a much higher charge per point up to four points per house, and commencing a lower scale with a minimum of five points, as the figures for the first quarter of 1924, 1925, and 1926 show, excluding council housing schemes. [See p. 152.]

Every gas salesman should obtain a copy of Technical Paper No. 12, issued by the Fuel Research Board, on "The Heating of Rooms," by Dr. Margaret Fishenden, and published by H.M. Stationery Office, price 1s. It is full of vital information for the technical gas salesman.

The following useful figures are found in Table VIII., p. 35, of that report.

From these figures it is easy to arrive at the cost of different types of competitive heating apparatus when once the thermal efficiency of the appliance is known.

The next table gives the relative

Gas Engines.

Gas per Therm.	Cost per B.H.P. Hour. 10,000 B.Th.U., or 0·1 Therm per B.H.P. Hour.	11,500 B.Th.U., or 0·115 Therm per B.H.P. Hour.	13,000 B.Th.U., or 0·13 Therm per B.H.P. Hour.
d.	d.	d.	d.
4·0	0·400	0·460	0·520
4·5	0·450	0·517	0·585
5·0	0·500	0·575	0·650
5·5	0·550	0·632	0·715
6·0	0·600	0·690	0·780
6·5	0·650	0·747	0·845
7·0	0·700	0·805	0·910
7·5	0·750	0·862	0·975
8·0	0·800	0·920	1·040
8·5	0·850	0·977	1·105
9·0	0·900	1·035	1·170
9·5	0·950	1·092	1·235
10·0	1·000	1·150	1·300

B.Th.U per Hour Required to Maintain Rooms at 65° Fahr., with Mean Outside Temperature 40° Fahr., taking account of the Heat Production of the Occupants.

Number of Occupants.	1000 C.Ft. Room.	2000 C.Ft. Room.	4000 C.Ft. Room.
——	B.Th.U. per Hour.	B Th.U. per Hour.	B.Th.U. per Hour.
1	3280	5375	8860
2	2925	5020	8510
3	2390	4685	8170
4	2245	4340	7830
6	—	3650	7140

Efficiency of Appliances.	B.Th.U. Required.	Price per Unit. ¼d.	½d.	1d.	1½d.	1½d.	C.Ft. of Gas Used.	Price per Therm. 6d.	8d.	9d.	10d.
100	3415	0·5	0·75	1·0	1·25	1·5	6·83	0·205	0·273	0·307	0·341
90	3794	0·55	0·83	1·1	1·39	1·6	7·58	0·227	0·303	0·341	0·379
80	4269	0·6	0·94	1·25	1·56	1·87	8·52	0·225	0·341	0·383	0·426
70	4878	0·71	1·07	1·4	1·78	2·14	9·76	0·293	0·388	0·439	0·488
60	5692	0·83	1·25	1·6	2·08	2·5	11·40	0·342	0·456	0·513	0·57
50	6830	1·0	1·5	2·0	2·5	3·0	13·60	0·408	0·544	0·612	0·68

1 unit = 3415 B.Th.U., or 6·83 c.ft. gas of 500 B.Th.U. per c.ft.

Electric Motors.

Efficiency.	Watts per B.H.P. Hour.	Cost per B.H.P. Hour, in Pence. Price per Unit. ¼d.	½d.	1d.	1½d.	1½d.	2d.
P.Ct.		d.	d.	d.	d.	d.	d.
100	746	0·373	0·559	0·746	0·932	1·119	1·492
90	828·8	0·414	0·622	0·829	1·036	1·244	1·658
85	877·6	0·438	0·657	0·877	1·096	1·315	1·754
84	880·0	0·440	0·660	0·880	1·100	1·320	1·760
83	898·6	0·449	0·673	0·898	1·123	1·347	1·796
80	932·4	0·466	0·699	0·932	1·165	1·398	1·864
75	994·5	0·497	0·745	0·994	1·243	1·491	1·988

Gas Lighting.	B.Th.U. per Hour per Burner.	Cost per Hour. Gas per Therm. 6d.	7d.	8d.	9d.	10d.
		d.	d.	d.	d.	d.
Low-pressure superheated inverted burner. 16 B.Th.U. per candle hour. 5 c.ft. per hour .	2496 B.Th.U. or 0·025 therms	0·15	0·175	0·2	0·225	0·250
High-pressure lamp, 10 B.Th.U. per candle hour. 28·5 c.ft. per hour	14,250 B.Th.U. or 0·1425 therms	0·855	0·998	1·140	1·283	1·425

Electric Lighting.	B.Th.U. per Hour per Lamp.	Cost per Hour. Price per Unit. 1d.	2d.	3d.	4d.	5d.	6d.	7d.	8d.
		d.	d.	d.	d.	d.	d.	d.	d.
150 watt 200 V. gas-filled lamp. 1·05 watts per c.p., 3·58 B.Th.U. per candle-hour. Aver. c.p. 148	529·8 B.Th.U. or 0·155 B.o.T. units.	0·155	0·310	0·465	0·620	0·775	0·930	1·085	1·240
1000 watts 200 V. gas-filled lamp. 0·765 watts per c.p., 2·6 B.Th.U. per candle-hour. Aver. c.p. 1310	3406 B.Th.U. or 1·002 units.	1·002	2·004	3·006	4·008	5·010	6·012	7·014	8·016

Efficiencies based on A. P. Trotter.

costs for gas and electricity for one Board of Trade unit (electrical) and its gas equivalent for varying thermal efficiencies of appliances and for different charges.

An interesting discussion followed, in which the following members took part: Messrs. R. J. Rogers, H. R. Hems, and A. Whitehead (Birmingham), and Mr. S. W. Simmons (Dudley).

A vote of thanks was accorded to Mr. Oughton, and it was announced that the next meeting of the Circle would be held at Leicester on July 7, when Mr. R. J. Rogers would give a paper on "The Gas Industry's Contribution to National Welfare," and Mr. G. M. Lewis a paper on "Sales Organization."

Southern District—Kent Area.

A Meeting of this Circle was held on June 3 at the offices of the Whitstable Gas Company.

Mr. O. ASHBY extended a hearty welcome to the members.

EFFICIENT VENTILATION OF GAS APPARATUS.

By P. PICKERING, Distribution and Sales Superintendent of the Rochester, Chatham, and Gillingham Gas Company.

Much of the past prejudice against gas apparatus was, I believe, largely due to improper ventilation. Ventilation faults can be divided into three classes:

1. Faulty construction (including inadequate size of flue outlet) of the apparatus itself.
2. Improper fixing.
3. Inadequate inlet ventilation in the rooms where gas appliances were used—*i.e.*, insufficient admission of fresh air.

We may, I think, now take it that gas appliances as they leave the manufacturers are, in most cases, as near perfect as present-day methods can make them. After the appliances have left the manufacturer, however, there are still two points to consider—efficient fixing of the apparatus and adequate ventilation of the apartment.

Architects are, in the newer buildings, giving much more thought than formerly to the question of ventilation; but meanwhile gas appliances have to be installed in old houses as well as new ones. It is therefore necessary that the gas salesman should be able not only to have the apparatus properly fixed, but also to satisfy himself that the conditions under which they will be used will give them fair chance of success.

PRINCIPLES OF VENTILATION.

Now let us see what happens at the inlet end of the flue or chimney. Take the example of a chimney in a room 14 ft. by 14 ft. and of average height. This room will contain approximately 2000 c.ft. of air space; and to change the air in this room five times per hour means that 10,000 c.ft. of air must pass up the chimney per hour. It also means—and this is the point I want you to notice—that 10,000 c.ft. of air must pass into the room through the doors, windows, or ventilators in the hour. We must, therefore, have in every room adequate inlet ventilation.

You will probably have come across a large room with a gas fire at one end and a coal fire at the other. When the gas fire only is alight, all is well; but when the coal fire also is alight, the products of combustion from the gas fire are drawn into the room. This is an example of inadequate inlet ventilation, as the gas fire flue acts as an inlet for the additional air required by the coal fire; the volume of the coal fire products being greater, and therefore exerting a stronger up-draught. The same thing will happen in separate rooms in houses which have insufficient inlet ventilation, provided the air can pass through doors, &c., from one room to another.

It now remains to consider what happens at the upper or outlet end of the flue or chimney. The products have arrived at this point solely by the superior weight of the colder outside air, and therefore their power is insignificant compared with the force of the wind. If we carry our chimney or flue well above the building, and also well above surrounding buildings, we shall most likely have the wind passing horizontally over the chimney or flue top, causing little trouble; but if our chimney is low, we may be in a region where the wind is being driven directly down it. We are all familiar with certain exposed positions where the wind always seems more troublesome, and these are brought about by the shape of the surrounding country, and in smaller local areas by the lay-out of the streets, buildings, roofs, &c. The observant person will have noticed that the higher chimneys seldom have cowls, but that most of the lower ones have them fitted. It would, therefore, appear that we must carry our chimneys or flues well above the roofs if we are to avoid these whirling, chopping, ricocheting winds.

GAS FIRES.

Most gas fires are fixed in front of existing fireplaces. In these cases the chimney should always be swept before fixing, and it should be ascertained whether the chimney is a single one or has branches. It should also be tested by means of a match or candle, to see whether it has the necessary up-draught. There may be a down-draught when no fire is in the grate, and an up-draught in the same chimney when the fire is in use. If the flue is found to be sluggish, or with occasional slight down-draught, a sheet of "Uralite" or sheet iron should be fitted, and in more stubborn cases a length of flue pipe carried up the chimney and finished with a cap or cone. The flue elbow should be constructed with easy upward bends. The cone can, if desired, be inverted with advantage to the flow of the products. In very stubborn cases of down-draught, a disc can be fitted in the chimney near the top, with a length of flue pipe running through it, with a cap or cone over the top. It must not be overlooked that there are instances where the up-draught is excessive, causing unnecessary loss of heat. This can generally be cured by admitting more air at the sides of the fire. Cases where the flames tend to lick underneath the firebrick when turned down low are generally due to excessive draught, which can be cured by seeing that the "Uralite" sheet is a good fit at floor level, and by admitting more air to the chimney at the sides of the fire.

The "injector-ventilator," which is specially constructed to assist in the ventilation of rooms, is so well known that I need not deal with it in detail in this paper. In passing I may say that it cannot be expected to extract the required quantity of air from the room if there is inadequate means for a similar quantity of air to enter the room. A point not generally known is that the injector-ventilator provides an additional insurance against escaping products during a temporary disturbance of air currents due to the opening and shutting of doors, &c., as the disturbed products from the inner passage will, in all probability, pass up the outer one.

"Nautilus" flues can be used with advantage in rooms not fitted with fireplaces, but it should be remembered that it is better that the top of the flue should be carried above the roof rather than finished with an air brick in the side of the wall.

Gas radiators should never be used in small rooms; they should be recommended only for large public halls and other well ventilated buildings.

GEYSERS.

Bathrooms are generally small, and geysers consume large quantities of gas in a short time. With these two points in mind, it will be realized that a geyser flue is most important. The vent pipe should always be of the same diameter as the socket on the geyser. The flue, which should preferably be of "Urastone," which is non-corrodible, should be carried as far up inside the room as possible, be fitted with an efficient baffler, then carried through the wall and continued outside above roof level, where it can be finished off with a cone or cap. It should not be overlooked that a baffler does not ensure the efficient ventilation of the geyser, but is only placed there for the purpose of preventing outside winds reaching the geyser burner. When piercing the wall it is a good idea to fit a metal sleeve to facilitate the easy removal of the geyser flue at any later date. A ventilation brick for the admission of fresh air into the bathroom is a great advantage in many cases. Geyser flues carried into false roofs cannot be recommended. There is generally a large amount of wind there, and one cannot always be sure where the products of combustion will eventually go.

GAS COPPERS.

To ensure successful working, the same conditions have to be fulfilled in connection with gas copper flues. This does not appear to be generally recognized by builders, who often carry a flue elbow direct from the copper through the wall to the outside, ending at a point 4 ft. or 5 ft. from ground-level. In most cases it will be found, on making a test, that these short flues act only as a fresh air inlet to the copper burner; the whole of the products of combustion being carried into the room.

Circulator flues can generally be connected to the kitchen chimney. If the boiler is not fitted with a flue with open bottom end, it is advisable to fix an open bottom tee, to prevent the burner being blown out by down-draught and also to prevent excessive pull on the burner by the flue.

In connection with circular flues we have another point to contend with—condensation. This has been known to be so troublesome in the case of long chimneys that it will saturate through the brick work and destroy interior decorations. This does not appear to happen with short chimneys or with circulators connected to kitchen chimneys where the kitchen fire is used occasionally. It seems, however, to be necessary to exercise caution before connecting circulators to bedroom chimneys and others which are not in regular use.

COOKING APPARATUS.

I am of the opinion that gas cookers, when fixed in well-ventilated sculleries, are better without flues; but where absolutely necessary, an open-ended tee should be fitted as recommended for the circulator. It is, of course, much better, though more expensive, to fit a hood, and ventilate the latter. Large hoods fitted over hotel cooking apparatus, &c., should pre-

ferably be ventilated at more than one point.

LIGHTING.

Gas burners do not, of course, need flues in the ordinary way, but the question of their ventilation is bound up with that of the adequate ventilation of rooms in which they are used. Warm air which is vitiated by the exhalations of the occupants naturally ascends; and, therefore, the proper place for outlet ventilation is at or near ceiling level. When gas is used for lighting purposes, this materially assists the upward flow of the vitiated atmosphere to the exit. In large halls, &c., where many people gather, the principle of ceiling ventilating lights is, therefore, very sound, and in most instances does away with the need for a ventilating fan. It must not be overlooked that there should be adequate inlet ventilation at breathing level. If the outlet ventilation in lofty buildings is excessive, cold air will often enter at the top of the building and, in finding its level, will cause down-draughts. Gas burners in a building of this type, properly distributed, will greatly assist in the prevention of these cold and dangerous draughts.

The whole problem of efficient ventilation in rooms is the constant movement of the air in an upward direction; and it cannot be disputed that gas burners greatly assist in this direction. It is useless to say that because certain forms of lighting do not themselves give off products of combustion they are more healthy than gas lighting, for the whole secret of healthy rooms lies in their efficient ventilation. It has been proved on many occasions, by actual tests, that, in rooms properly ventilated, gas burners assist in providing a quicker change of air, and hence a cleaner air for the occupants.

In conclusion, I should like to urge all gas salesmen to look more fully into the question of the ventilation of rooms and houses in which gas consuming appliances are fixed.

Mr. J. J. PATERSON (Dover) proposed, and Mr. D. MARSH (Broadstairs) seconded, a vote of thanks to Mr. Pickering for his paper.

Southern District—Sub-Section "A."

A well-attended meeting of the Circle was held on May 3, at the Friar Street Offices of the Reading Gas Company, under the chairmanship of Mr. C. J. EVES.

THE WHY AND WHEREFORE OF BUSINESS.

By E. J. LIKEMAN, of the Reading Gas Company.

Over 280 billion c.ft. of gas were used in Great Britain in 1924. The British gas industry represents £160,000,000 of capital, invested in 1500 undertakings. In 1924 it carbonized some 17 million tons of coal. It serves 8½ million consumers and employs over 100,000 men—*i.e.*, there are 85 customers per workman. These figures enable us to take a wider view than is possible by restricting our attention to our daily tasks. It is to the advantage of our customers, our employers, and ourselves to have this wider view of our business. We have our job to do. Our work is to please our customers, satisfy our employers, and advance ourselves. But we, individually, are merely items in an organization—the undertaking; and the latter is but one of many all doing much the same work throughout the world. The joint activities of all the gas undertakings in the world form but a small proportion of the world's business. There can be no doubt about the importance of the salesman. He is the link between the producer and the consumer. Mr. Likeman dwelt at some length on the art of salesmanship and all points specially worth study. He then dealt particularly with the attitude of the salesman towards his customers.

The keynote of the gas industry is public service. The oftener we succeed in striking this keynote in our dealings with the public, the more shall we enjoy their confidence. Woman originated civilisation. She inspired the arts and the crafts; she made it worth while to come back to her; she made the home. Most earnestly, then, would I say to all gas salesmen, concentrate on the ladies; study feminine psychology; beware of woman's intuition. Be sincere; try to realize the monotony and drudgery of housework; try to get the woman's point of view. In dealing with architects, builders, &c., you will view the discussion from a new and helpful angle. We can do more business by a closer attention to, a wider interest in, and a deeper knowledge of, (1) the goods we want to sell, and (2) the people to whom we sell them.

The CHAIRMAN thanked Mr. Likeman for his paper.

All-Round Cooking Efficiency.

What are the advantages, ask Messrs. Radiation Limited in a brochure they have just published, of moving the flue outlet of a gas oven from the top to the bottom? In answer to this query they put forward the following: A higher efficiency; a more equally heated oven; improved cooking, owing to the steam-rich atmosphere which is produced; all the oven space is good cooking space; food can be cooked perfectly without the necessity for altering its position during cooking; and thermostatic control can be introduced. All these desirable features, it is remarked, are embodied in the "New World" cooker.

REQUIREMENTS OF A COOKER.

The brochure goes on to say that the following requirements are necessary in order properly to satisfy the cooker oven tests of the Institution of Gas Engineers.

1. A modern gas oven of the packed type must be capable of attaining a temperature of 400° Fahr. twelve minutes after lighting.
2. To provide a suitable factor of safety, it must be possible, with the door and all other joints sealed, to increase by at least 60 p.ct., without smothering, the gas consumption necessary to satisfy condition 1. [Messrs. Radiation, it may be mentioned, have adopted a standard of 100 p.ct. overload.]
3. It must be possible to load the oven fully with bread or other foodstuff, and cook it without the necessity for altering the position of any article in the oven.

The "New World" oven was designed to pass these tests.

Messrs. Radiation state that many cookers of the ordinary type with the flue outlet at the top would satisfy condition 1 and condition 2, while few would satisfy condition 3.

If, with such cookers, the flue outlet, instead of being at the top, is brought to the bottom of the oven, it is then found that they no longer satisfy condition 2. To make such an altered oven satisfy condition 2 would involve re-designing the burner system; and even then such an altered oven would still not satisfy condition 3. It is impossible to make ordinary gas ovens, with the flue removed from the top to the bottom, satisfy both conditions 2 and 3.

They remark that an improvisation can be effected with ordinary types of oven to enable the advantage of the bottom flue outlet to be partly attained while still satisfying the non-smothering condition. A flue outlet can be made directly through the back, at the bottom of the cooking space, of ovens that have not been specially constructed for a bottom flue outlet; but when this is done the products will not pass away unless a suitable length of flue is attached to give the necessary "pull." This expedient, while it prevents smothering, causes more air to pass through than is necessary in a properly designed oven with flue outlet at the bottom, and as a consequence of this there is a drop in thermal and cooking efficiencies. In adopting a makeshift of this type it is essential that the additional pull shall not be attained by leading the products up between the cooker linings, as condensate will collect in such a flue passage and cause corrosion of the enamel, or of the casting with which it comes into contact, and thus reduce the life of the cooker. Further, such an oven would still not conform to condition 3.

THE REQUIREMENTS SATISFIED.

For a gas oven to satisfy conditions 1, 2, and 3, an entirely new burner system and general oven arrangement have to be provided. It was only after prolonged and careful research work that Messrs. Radiation discovered means of so using the bottom outlet as to produce a new type of cooker satisfying these conditions and attaining a high thermal efficiency, employing this bottom flue outlet without additional "pull."

The improved atmospheric conditions within this oven enable better cooking to be effected than has been possible previously with a gas oven. The makers were able to satisfy the three requirements previously mentioned, and, in addition, to introduce thermostatic control in the form of the "Regulo."

Messrs. Radiation conclude their new booklet by remarking that it must not be overlooked that the higher the efficiency of a gas oven the greater the amount of condensate produced; and here it is necessary to sound a note of warning. Unless efficiency is to be sacrificed, the formation of this condensate in the initial stages of heating up is unavoidable, and the necessity for duly restricting the formation of condensate sets a limit to the development in efficiency which might otherwise be effected. It is owing to the formation of condensate that a direct, or readily accessible, flue outlet is essential.

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VERITAS LIGHT WORKS
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Everything for Gas Lighting, Heating and Cooking.
See Advert. on p. 634 of "JOURNAL," June 23.

HOW TO DEMONSTRATE CONTROL OF GAS COOKING.

An interesting way to demonstrate to the Public how completely the "Regulo" controls the oven heat of the latest Radiation "JUNIOR" Cookers ("New World" patents) under all circumstances is as follows:—

Set the "Regulo" at any point and light up the oven burner. After the oven has become heated, as indicated by the fact that the flames have become small, just open the oven door. In under two minutes the flames, which will have been small when the door was opened, will be seen gradually to extend in length, compensating at once for the reduction in the temperature caused by the open door.

This is the most convincing way of showing that gas is now easily the most economical fuel for cooking.

Full particulars and illustrated booklet of any "JUNIOR" Gas Cookers sent on request as below.

Radiation
LIMITED

ARDEN HILL & CO., Birmingham and London. ("*Acme Junior*").
THE DAVIS GAS STOVE CO., Ltd., London and Luton. ("*Alpine Junior*").
FLETCHER, RUSSELL & CO., Ltd., Warrington and London. ("*Ringway Junior*").
THE RICHMOND GAS STOVE & METER CO., Ltd., Warrington and London. ("*Bungalow Junior*").
WILSONS & MATHIESONS, Ltd., Leeds and London. ("*Wilson Junior*").
JOHN WRIGHT & CO., Birmingham and London. ("*Eureka Junior*").

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A new cooker for small homes. Fitted with 3-burner hotplate.
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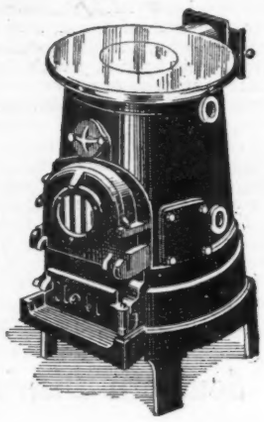

Where the GLOW-WORM scores

The
THIRD POINT

All "Glow-Worm" Boilers have a double set of tappings, for the flow and return pipes.

These tappings are so placed that it is a very easy matter for the Fitter to connect up to existing hot water pipes or to run new piping where no hot water installation already exists.

The other set of tappings may be used for connecting up to a Towel Rail or Hot Water Radiation, if required.

All "Glow Worm" Boilers are fitted with large man lids for ease of cleaning the waterways of the boiler.

In every case, the "Glow Worm" Boilers can be opened and cleaned *in situ*, thereby minimising the cost of this operation, which should be done about every nine or twelve months, according to the hardness of the water.

Other patented and special features will appear in following advertisements. Gas Salesmen are requested to study the whole series and so learn all the selling points of the "Glow-Worm"

O. BRUSTER & RICHARDSON
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